

REMARKS

By the above actions, claims 1 & 15 have been amended and claims 2-10 properly renumbered as claims 12-20. In view of these actions and the following remarks, reconsideration of this application is now requested.

Claims 11-20 were rejected under 35 U.S.C. § 103 as being unpatentable over the Bruney patent when viewed in combination with the Larson et al. and Porazzo et al. patents. This rejection, to the extent it may apply to the claims as now presented, should be withdrawn for the following reasons.

Amended claim 11 now contains the feature previously presented in claim 14 has been revised to more clearly relate to the subject matter shown in Figs. 3 & 4 with regard to the *“planar diaphragm having a plurality of conductors on a region of its planar surface”* and the *“edges of said plates being arranged only on one side of said region.”* It appears clearly from the text and the figures that the plates are arranged on the same side as the magnets, and there would be no possibility to have the magnets on one side and the plates, or some of the plates on the other side of the diaphragm. Thus, claim 11 recites that there are *“magnets arranged on one side of said diaphragm”* and that *“said magnetically conducting material is configured as plates on said one side of the diaphragm.”*

Furthermore, amended claim 11 indicates that the arrangement is adapted to form *“magnetic field lines substantially parallel with said diaphragm.”* The basis for this feature is to be found in the description page 7 lines 4-5: *“The magnetic field lines are in reality much more parallel with the diaphragm than those drawn on figure 5a.”*, Figs. 3 & 5, and the introductory description on page 1, lines 23-25: *“In order to produce proper sound, the diaphragm 100 has to move transversely to the plane of the diaphragm, which requires magnetic field lines 104 which are parallel to the plane and normal to the conductors on the diaphragm.”*

Turning now to the distinctions between the present invention and the prior art and the obviousness thereof, firstly, it is noted that the Examiner has acknowledged that the feature of original claim 11 that *“said magnetically conducting material is not a permanent magnet”*. Is not disclosed by Bruney. Furthermore, amended claim 11 contains the feature that *“said magnetically conducting material is configured as plates, between which permanent magnets*

are located, where one edge of each of said plates constitutes a magnetic pole” and Porazzo does not disclose plates, between which permanent magnets are located, where one edge of each of said plates constitutes a magnetic pole for driving the diaphragm. Also, amended claim 11 contains the feature that “a planar diaphragm having a plurality of conductors on a region of its planar surface” and “said edges of said plates being arranged only on one side of said region.” Larson discloses a diaphragm with a region, namely vanes 35, having a plurality of conductors. These vanes are arranged in pole piece gaps 13 with pole pieces 44, 46 in the form of plates on either side of the region/vanes 35. However, Larson does not disclose that the plates are only on one side of the region. Thus, the issue is what would make it obvious to combine these three references in a manner that would lead to the invention as now claimed.

As stated in the description on page 1 lines 6-12 :

As loudspeakers, mainly two types are common. The one type comprises an annular coil disposed in a transverse magnetic field, where the coil is connected to a diaphragm, usually conical in shape. Current flowing through the coil results in a force moving the diaphragm. The second type comprises a planar diaphragm, where conductors are positioned on the planar surface. A magnetic assembly behind or at the sides of the membrane results in displacement of the membrane, when current flows through the conductors.

In fact, the loudspeaker by Larson belongs to the first type of loudspeaker, even though the diaphragm is planar. This is so, because the conductors, i.e., “the coil,” are located at a distance behind the diaphragm and react on magnetic field lines behind the diaphragm and not on magnetic field lines through the diaphragm. On the other hand, the loudspeaker of Bruney is a loudspeaker of the second type. In this case, the membrane is moved back and forth according to the resultant (or sum) of the forces acting on the conductors. Even though the magnetic field may have components parallel to the diaphragm, it can also have substantial components in other directions as explained in connection with respect to the prior art shown in Figs. 1a & 1b of the present application. The parallel components acting on the conductors average out but cause distortions in the membrane that lead to an inferior sound quality. Though the resultant force is normal to the diaphragm plane, causing excursion in and out movement of the membrane, the result is a low efficiency of the system of D1. This fact is also discussed in the present specification on page 1 at lines 19-29.

The invention is of the second type of loudspeakers. This fact is brought out in amended claim 11, by the features that:

- said magnets are in magnetic interaction with a magnetically conducting material to conduct magnetic field strength from said magnets to said diaphragm,
- said magnetically conducting material is not a permanent magnet, and
- said magnetically conducting material is configured as plates on said one side of the diaphragm, between which permanent magnets are located, where one edge of each of said plates constitutes a magnetic pole,
- said edges of said plates being arranged only on one side of said region for providing field strength through said diaphragm with magnetic field lines substantially parallel with said region.

Because the magnets and the magnetically conducting plates are arranged on only one side of the region with the conductors - in contrast to Bruney, where the plates are arranged on both sides of the region - it is assured that field strength through the diaphragm is provided with magnetic field lines that are substantially parallel with said region, see Fig. 3. This implies that, as stated in claim 11, that the electromagnetic "*force acting on said conductors is directed substantially normal to said surface.*" This results in the high efficiency of the loudspeaker according to the invention because the force components that are not parallel become negligible. The resulting benefit is as stated in the description that a diaphragm transducer of the above mentioned second type has a higher efficiency than known systems.

Bruney discloses a diaphragm transducer of a known type, where magnets are arranged behind the diaphragm. The result is a low efficiency as discussed in the description in connection with Fig. 1 of the present application. If the person of ordinary skill were to aim for an improvement, it would not be possible to combine the Larson and Bruney types because Bruney has conductors on the diaphragm itself, whereas Larson has conductors behind the diaphragm and they operate based on two different principles that are incompatible with each other.

Amended claim 11 represents an unobvious departure from the teachings of Bruney and Larson that is based on the fact that the present inventor realized and utilized the true but unexpected propagation of field lines between iron plates, as described comparing Fig. 3 with

Fig. 1b in the present application. Without the present inventor's discovery, the person of ordinary skill would have no incentive to develop loudspeakers as is defined by amended claim 11. There would be no reason or motivation whatsoever for Bruney to use plates to shape the field, because the result effect had not been recognized. That is, even when using Bruney as a starting point, there would be no teaching that plates should be used to improve the system and there would be no indication as to how to use plates in order to achieve an improvement. The problem to be addressed is not mentioned in Bruney and no solution is given.


In the case of Larson, the effect of iron plates to shape the field has not fully been recognized either. Larson could substitute magnets for the iron plates 44, 46 and achieve the same effect, because the effect on the conductors in Larson is independent of whether magnets are used or the iron plates as illustrated. The only benefit attributed to the use of plates is their effect of removing heat; see col. 6, line 32-33. The teaching of Larson is that conductors have to be placed between pole gaps such that magnets are on both sides of the conductors. If this teaching is used on Bruney's diaphragm, magnets would have to be arranged at both edges of the diaphragm. However, this would lead to a known solution with very low efficiency. If the magnets are arranged in front and behind the diaphragm in order to enclose the conductors, the loudspeaker would not function. Thus, the man of ordinary skill in the art using a combination of the teaching of Bruney and Larsons would not be led to any useful solution.

Thus, neither Bruney nor Larson provides any reason or motivation to make changes of the type that would lead to the invention defined by amended claim 11. In fact, their teachings are incompatible. Therefore, amended claim 11 is non-obvious over any combination of these two documents. As for Porazzo, since this patent (which is only cited by the Examiner for its disclosure of the use of a magnetically conducting layer) does not disclose the use of plates, between which permanent magnets are located, where one edge of each of said plates constitutes a magnetic pole for driving the diaphragm, Porazzo cannot overcome the basic deficiencies of the proposed combination of the Bruney and Larson patents, so that the invention is equally unobvious whether or not the Porazzo patent is considered in combination with the incompatible Bruney and Larson patents.

Therefore, for all of the foregoing reasons, reconsideration and withdrawal of the outstanding rejection under § 103 is in order and is hereby requested.

While the present application is now believed to be in condition for allowance, should the Examiner find some issue to remain unresolved, or should any new issues arise, which could be eliminated through discussions with applicant's representative, then the Examiner is invited to contact the undersigned by telephone in order that the further prosecution of this application can thereby be expedited.

Respectfully submitted,

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